Journal of the Minnesota Academy of Science

Volume 53 | Number 2 Article 4

1988

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The Change in Factors Affecting Physician Choice of Practice Location: A Comparison of Younger and Older Rural and Metropolitan Physicians

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ABSTRACT—This study uses multiple discriminant analysis to derive the factors that physicians deem important in their decisions about where to locate their medical practices. Older physicians are compared to younger physicians both within rural areas and within metropolitan areas. Three of the top four discriminating variables for the youngest doctors were influence of the preceptorship period, preference of the spouse, and the repayment of a forgiveness loan. For the oldest group of doctors, two of the top three discriminating variables were the opportunity to join a desirable two-person partnership, and the perception of a high medical need in the area.

Introduction

The geographic distribution of physicians continues to be a major public policy concern. The high degree of specialization among recent medical school graduates has accentuated the fear that areas outside urban centers will remain underserved despite the large increase in the number of physicians. It is said that specialists prefer metropolitan areas and locate there in excessive numbers because they are less subject to economic competition than are providers of other types of goods and services.

Many programs have been proposed to alter the geographic distribution of physicians. Even as extreme a program as mandatory rural service (requiring all graduating doctors to practice a certain length of time in rural areas) has been debated in the U.S. Senate. Other frequently mentioned policy options include establishing or encouraging Area Health Education Centers (AHECs), more rural group practices, preferential medical school admissions for students from rural areas, loan forgiveness for practice in a designated shortage area, rural preceptorships, community recruitment, as well as influencing specialty choice to increase the proportion of primary care physicians. (AHECs are medical centers in rural areas that would provide residency training, continuing education courses and clinical support for physicians practicing in the area, and patient care for the surrounding population. In a rural preceptorship, a medical student spends a few weeks assisting a rural physician who is involved in patient care. Community recruitment may involve anything from a community presenting itself in the best light to income supplements or guarantees.) This list, though not exhaustive, does include the most commonly mentioned policy options aimed at altering physician distribution (1).

In the late 1960s and during the 1970s, public policy encouraged academic medicine to increase the supply of physicians by starting new medical schools and enlarging the classes of existing medical schools. The policy was remarkably successful in doubling the annual number of medical school graduates in a little more than a decade. However, many persons concerned with health policy have argued that the mere increase in numbers of physicians will do little to increase the supply of physicians in nonmetropolitan areas (2,3,4).

Examining what has happened in Minnesota between 1963 and 1981, it is noted that the overall Minnesota physician-to-population ratio for patient care physicians has increased by 40%. If we take that figure, however, and compare it to what has happened in the rural counties, we find that the rural physician-to-population ratio has increased by less than 20% (5,6).

The importance of the primary care physician in the health delivery network is undeniable. This study concerns itself with one important component of primary care, that which is provided by the general practice (GP)/family practice (FP) doctor (2). How does Minnesota compare to national norms regarding its supply of FP/GPs? According to the American Academy of Family Physicians, an area is a family physician shortage area if there is less than one active FP/GP per 2,750 persons. This is equal to 36.4 FP/GPs per 100,000 persons. Another criterion that is similar to the above is that proposed by the Graduate Medical Education National Advisory Committee (GMENAC). According to GMENAC, the recommended number of FP/GP physicians per 100,000 population is 34.5 (2). Since the Minnesota *average* is 34.5 FP/GPs per 100,000 persons, clearly many Minnesota counties are below this critical level.

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Table 1. Variables hypothesized to be influential in a physician's choice of practice location. Variable codes and full names.

Code	Full Name	Code	Full Name
Income	Income potential	Cominflu	Prospect of being more influential in community affairs
Climate	Preferable climate		
Geogfeat	Preferable geographic features	Culture	Cultural advantages
Simcimun	Same as or similar to the community in which you grew up	Comprosp	Prosperity of community
		Urbrurpf	Preference for urban or rural living
Loanpay	Payment of "forgiveness" loan	Socserv	Availability of good social service, welfare, or home care services
Spousprf	Preference of spouse		
Famnear	Nearness to family and friends	Solooppr	Opportunity to enter an established solo practice
Medneed	High medical need in area	Twopart	Opportunity to join a desirable two-person partnership
Preceptr	Influence of preceptorship program		
Histloc	Having gone through medical school, internship, residency, or military service near here	Grouppra	Opportunity to join a desirable group practice
		Loanaval	Availability of loans for beginning practice
MDadvice	Advice of older physician	Instpref	Opportunity to work with a specific institution
Comrecrt	Recruitment efforts of the community	Meded	Access to continuing medical education
Social	Opportunities for social life	Emergncy	Availability of emergency medical services
Recsport	Recreational and sports facilities	Spclaval	Availability of physician specialists
Edusystm	Quality of educational system for children	Nearhosp	Proximity to hospital facilities

Materials and Methods

In order to determine the difference in factors affecting older versus younger physicians' choice of practice location, a comprehensive mail survey of all Minnesota family practice and general practice physicians was conducted. Variables thought to be important in the location decision were constructed to include professional interest variables, life-style dimensions, financial motivations, community recruitment efforts, and perceptions of medical need in the area. Hassinger (7) and Scheffler (8), among others, have commented in depth on these dimensions. A total of 29 variables were constructed and included in the analysis. Table 1 provides an enumeration of these variables and their computer-coded names.

The questionnaire was mailed to 1,057 Minnesota FP/GP physicians during the Summer of 1984. Five days after the initial mailing, a second mailing was undertaken. Questionnaires were sent via first-class mail and included a cover letter from the Dean of the University of Minnesota, Duluth Medical School. A first-class, stamped, return envelope was provided for the physicians' responses. This sampling technique produced 658 usable responses (62%). Breaking down the survey, 614 physicians were sampled from counties classified as Standard Metropolitan Statistical Areas (SMSAs), with 345 usable responses (56%), and 443 physicians were sampled from non-SMSA counties, with 313 usable responses (71%). According to the federal government's Office of Statistical Policy and Standards, a SMSA is defined as having either one city of at least 50,000 population, or one city with at least 25,000 population, which, when combined with adjacent areas having a population density of 1,000 or more per square mile, will have a population of at least 50,000.

The remainder of this paper reports on the use of multiple discriminant analysis to differentiate various groups of physicians according to the relative importance of factors used in their practice location decisions.

Results and Discussion

The 658 responding physicians were categorized into the following eight groups: 1. Rural physicians in practice for five or fewer years; 2. Rural physicians in practice between six and 10 years, inclusive; 3. Rural physicians in practice between 11 and 20 years, inclusive; 4. Rural physicians in practice for 21 or more years; 5. Metropolitan physicians in practice between six and ten years, inclusive; 7. Metropolitan physicians in practice between 11 and 20 years, inclusive; and 8. Metropolitan physicians in practice for 21 or more years. Note that only physicians engaged in active patient-care practices were included in this study.

The effect of time on the relative importance of the 29 choice of location variables was determined by performing discriminant analysis on selected pairs of the above-listed eight groups of physicians. Discriminant analysis is useful when the analyst is interested either in understanding group differences or in correctly classifying statistical units into groups or classes. Discriminant analysis, therefore, can be considered either a type of profile analysis or an analytical predictive technique (9). For this study, profile analysis is our principal concern. Correct classification rates are reported mainly as a check on the adequacy of our discriminant functions. A stepwise method, using the Wilks criterion, was used to determine which of the 29 variables to include in each discriminant model. The Wilks criterion attempts to maximize the overall multivariate F-ratio test of differences among the group centroids.

Complete results, which are available from the author, compare the discriminant functions of those doctors in practice for five or fewer years with those doctors in practice between six and 10 years, those doctors in practice between six and 10 years with those doctors in practice between 11 and 20 years, and those doctors in practice between 11 and 20 years with those doctors in practice 21 or more years. These comparisons were performed separately on metropolitan physicians and rural physicians. Because of space limitations, this paper will report only the polar extreme comparisons.

Table 2 presents the results of discriminating between the youngest and oldest rural physicians. We would expect this discrimination to generate the clearest differences among the physician groups. A comparison of the absolute values of the standardized discriminant function coefficients can be used to identify those variables that are relatively more important in providing the separation between the groups.

The interpretation of these weights is similar to the interpretation of beta weights in multiple linear regression. The sign of the coefficient indicates whether the associated variable is making a positive or negative contribution to the net value of the discriminant function. For this particular analysis, discriminant function coefficients with negative signs are contributing to the centroid value of the oldest group of physicians, and those variables with positive discriminant coefficients are contributing to the centroid value of the youngest doctors. The four most discriminating variables for the young rural GP/FP doctor are the influence of the preceptorship, preference of the spouse, availability of specialists, and the repayment of a "forgiveness" loan. For those physicians in practice for more than 20 years, the prosperity of the community and the opportunity to join a desirable two-person partnership were the most important contributors. Many of the variables affecting the youngest doctors were not available 20 years ago to the extent that they are now. The ranked partial F-values also indicate which variables have the greatest discriminating power; e.g., preceptorship is the best discriminator.

Table 2. The discriminant model resulting from discriminating between rural doctors in practice for five or fewer years (group R1) and rural doctors in practice for 21 or more years (group R4).

Centroids of Groups (Group means): R1 2.11071 R4 -0.74834			
Standardized Discriminant Function Coefficients (17 variables)		Partial F-Values (ranked)	
Climate	.31	Preceptr	23.83
Geogfeat	-.23	Spousprf	17.27
Loanpay	.37	Loanpay	9.55
Spousprf	.49	Twopart	8.19
Medneed	-.27	Spclaval	7.44
Preceptr	.58	Comprosp	6.23
MDadvice	-.21	Medneed	4.89
Edusystm	-.25	Nearhosp	4.43
Comprosp	-.38	Climate	3.85
Urbrurpf	.20	Meded	3.41
Solooppr	-.22	Edusystm	2.79
Twopart	-.35	Solooppr	2.66
Grouppra	.17	MDadvice	2.63
Loanaval	.17	Urbrurpf	2.51
Meded	-.26	Geogfeat	1.85
Spclaval	.41	Loanaval	1.53
Nearhosp	-.26	Grouppra	1.51

Additionally, in each case, the original samples of doctors were split in halves with one half used for the derivation of the discriminant function while the other half (the holdout sample) was used for validation of the function's predictive power. The discriminant function for rural doctors is quite powerful, with 90.5% of the holdout cases correctly classified by our model (Table 3). These classification results are significantly better than the proportion of correct classifications achievable without the model, through the utilization of a proportional chance criterion (10). The expectation of correct classifications using the proportional chance criterion is 62.5%. The Student's t-test of the significance of the difference between the discriminant model's percent of correct classifications (90.5%) and the proportional chance percent correct (62.5%) proves significant at the .001 level (t is 8.7 with 178 degrees of freedom).

Table 3. Results of using the discriminant function to predict group membership among the rural doctors in the holdout sample.

Actual Group	Number of Cases	Predicted Group Membership R1[a]	R4[b]
R1	45	36 (80.0%)	9 (20.0%)
R4	134	8 (6.0%)	126 94.0%)

[a]group R1 consists of rural doctors in practice for five or fewer years
[b]group R4 consists of rural doctors in practice for 21 or more years

Table 4 presents the results of discriminating between the youngest and the oldest of the metropolitan physician groups. Again, as when making a comparison of the polar extremes of the rural doctor groups, this particular comparison should give us the clearest differentiation between the groups. The four most important variables contributing to the centroid value of the youngest doctors are the influence of the preceptorship period, the preference of the spouse, the availability of emergency medical services, and the payment of a forgiveness loan. For the doctors who have been in practice for more than 20 years, the main discriminating variables were the quality of the children's educational system, the opportunity to join a desirable two-person partnership, the perception of a high medical need in the area, and the opportunity to enter an established solo practice. As was the case with the rural polar extremes, the classificatory power of this model is quite high (Table 5). We find that the rate of doctors correctly classified is 90.05%, as compared to the expected value of the proportional chance criterion of 55%. This difference proves significant at the .001 level (t is 10.2 with 190 degrees of freedom).

Table 4. The discriminant model resulting from discriminating between metropolitan doctors in practice for five or fewer years (group M1) and metropolitan doctors in practice for 21 or more years (group M4).

Centroids of Groups (Group means): M1 -1.38690 M4 .76898			
Standardized Discriminant Function Coefficients (18 variables)		Partial F-Values (ranked)	
Climate	.21	Edusystm	17.91
Geogfeat	-.32	Preceptr	12.72
Loanpay	.37	Twopart	12.28
Spousprf	-.41	Spousprf	10.38
Medneed	.42	Medneed	9.25
Preceptr	-.48	Solooppr	6.65
Histloc	-.14	Loanpay	6.58
MDadvice	.25	Emergncy	5.10
Social	-.29	Social	4.22
Edusystm	.54	MDadvice	3.52
Socserv	-.23	Geogfeat	2.77
Twopart	.44	Socserv	2.30
Loanaval	-.22	Loanaval	2.18
Instpref	.20	Meded	1.64
Meded	.23	Instpref	1.63
Emergncy	-.40	Climate	1.26
Solooppr	.41	Histloc	1.20

Communities and organizations that wish to recruit physicians into their areas must be cognizant of the changing value structure of the new physicians being graduated from our medical schools. What doctors thought to be important

community and professional attributes 20 years ago are no longer the distinguishing influences that they used to be. This can be most clearly seen by examining the two polar extreme cases in this study. Three of the top four discriminating variables for those doctors in practice for five or fewer years were influence of the preceptorship period, preference of the spouse, and the repayment of a forgiveness loan. For the oldest group of doctors (those in practice for more than 20 years), two of the top three discriminating variables were the opportunity to join a desirable two-person partnership, and the perception of a high medical need in the area.

Table 5. Results of using the discriminant function to predict group membership among the metropolitan doctors in the holdout sample.

Actual Group	Number of Cases	Predicted Group Membership M1[a]	M4[b]
M1	65	56 (86.2%)	9 (13.8%)
M4	126	10 (7.9%)	116 (92.1%)

[a]group M1 consists of metropolitan doctors in practice for five or fewer years

[b]group M4 consists of metropolitan doctors in practice for 21 or more years

The next phase in this work will be to discriminate between groups of rural and metropolitan physicians. It is hypothesized that different attributes will influence the location decisions of doctors from the rural and metropolitan populations. Discriminant analysis should provide a useful technique for comparing rural and metropolitan doctors from the different age groups.

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